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Louisville snags major technology win: City is one of 25 connection points nationwide for latest Internet network

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University of Louisville technology czars recently staged a coup of sorts that has brought Kentucky a remarkable technology victory.

There's a lot of techno-talk involved to explain how they snagged an invaluable networking resource for Kentucky. But suffice to say that the long-term benefits for economic development and growth of research initiatives are huge, according to the principals involved.

Such future success stories are possible because some part-daring/part-ingenious U of L tech administrators finagled a rare connection point along the newly developing, super-fast network resource nicknamed "NewNet."

This hook up is 10 times faster than the national network that research universities have been using for the past decade, which already was a significant improvement over the commercial Internet most consumers and businesses access today.

So what are the possibilities?

- * Imagine a Louisville surgeon being able to broadcast a real-time video of a hand transplant in high definition to medical professionals at hospitals and medical schools across the country.

- * Imagine local researchers and entrepreneurs having a dedicated line, similar to a virtual private network, that they could use for an hour, a week or even a month to transmit large amounts of data and video to counterparts in California or Boston.

- * Imagine a rural community college being able to offer highly specialized courses and degree programs by virtually connecting its students with classes at larger institutions, such as U of L or University of Kentucky. The connection would allow students to interact as they would face-to-face with no delay in transmission -- a big step up from today's videoconferencing technology.

- * Imagine higher education institutions across the state pooling resources to create one disaster-recovery center that each school could tap into to ensure there is no down time for any of their systems.

* Imagine Kentucky businesses using the super-fast transmission speeds to send data to all parts of the country and the world. For a price, Kentucky businesses will be able to connect to this system -- something not possible with NewNet's predecessor, known as the Abilene network.

A great victory indeed. But Kentucky almost missed out on those opportunities.

Summer 2006: so close and yet so far

Kevin Shively, senior network analyst for U of L, thought Louisville and Kentucky had missed the Internet on ramp, per se, when he attended an Internet2 technology conference in Indianapolis last summer.

It was there he learned that Internet2, an Ann Arbor, Mich.-based nonprofit consortium, which was in the process of building a third-generation Internet network, planned to bypass Louisville as a connection point for its infrastructure.

Even though Internet2's fiber-optic cabling was scheduled to be laid within 200 feet of U of L's existing fiber-optic network and some equipment would be located here, the technology group planned to connect in Cincinnati instead, making the city upriver one of 25 switching nodes in the country.

The slight meant more than just being overlooked, Shively said.

Not gaining access to the NewNet network had potentially devastating ramifications for the state's research institutions, education systems, and economic development efforts, he explained.

For example, the bandwidth and capabilities that NewNet offers are, in most cases, a prerequisite demanded by most qualified researchers U of L tries to recruit. Plus, it is needed to retain existing researchers who have been using NewNet's predecessor, the Abilene network, which is being replaced by this newer technology.

U of L and other Kentucky institutions could have connected to the Cincinnati switching node, Shively said, but doing so would have cost upward of \$1 million per year -- a significant chunk of change.

The University of Kentucky faced a similar dilemma. And if the major research universities had to struggle to connect, it would have been an even more daunting challenge for K-12 school systems -- and businesses. Playing a little 'techno-poker'

Shively thought the deal was done, that there probably was not anything the university or the state could do at that point to reverse Internet2's

decision.

But when he relayed what he learned to Tom Sawyer, U of L's acting vice president for the Office of Information Technology, Sawyer was determined not to give up without a fight.

"It was extremely important for us to get this done," he said with conviction. "We needed to go after this."

So he contacted Internet2 to get some answers and to formulate an action plan.

Word came back that, to be a connection point, Louisville had to be part of a statewide or regional optical network. That's part of the criteria Internet2 officials look for when selecting where to place the infrastructure, said Ana Preston, senior program manager for Internet2.

At the time, she added, Internet2 officials were unaware that such a network was being conceptualized in Kentucky.

When Internet2 officials wanted to know when the Kentucky RON would be finished, Sawyer countered with, "When does it need to be completed?"

Discussions quickly turned to action on the Kentucky RON, as Sawyer worked to make an all-out effort to secure the switching node, he said.
A model worth emulating

After sparking the interest of Internet2 officials, Sawyer and members of his staff, including Shively and Michael Dyre, director of research and development for U of L's Office of Information Technology, began laying the groundwork needed to make the Kentucky RON a reality.

They enlisted the support of two key players, the University of Kentucky and the state's Council for Postsecondary Education, as well as other school systems and technology vendors.

The group has solidified quickly and bought into the vision of what NewNet can do for the Bluegrass State in terms of research, education and economic development, Sawyer said.

That united front also has impressed Internet2 officials, who met with the Kentucky consortium last fall.

Preston said it was clear that there was a lot of collaboration and dialogue taking place between schools at various education levels.

In particular, the group was not just excited about how NewNet could affect higher education, but they also were looking at what the increased capability could mean for elementary and secondary schools.

The collaborative approach has "been a model I would love to see other states emulate," Preston said. "We're very excited about this."

She added that the Kentucky group clearly was motivated by the possibilities, and that enthusiasm and foresight was a significant driver in Internet2's decision to take a second look at the Bluegrass State. Gaining a 'seat at the table'

After further study, Preston said, the Internet2 group decided it made sense to locate the technology in Kentucky after all.

From a technical standpoint, it was feasible and fairly simply to connect because of the NewNet infrastructure's proximity to U of L's network.

Plus, Louisville's geography made it a logical choice as a switching node on the infrastructure that runs from Chicago to Atlanta.

"Some very good synergies came into play," Preston said.

So the decision was made to locate the switching node in Louisville, securing Kentucky a place on the technology map.

Garnering the switching node also was a huge win for U of L, Sawyer said. He added that having the node here and being connected to this new technology gives U of L "a seat at the table" alongside other major research universities, such as the University of Michigan and Indiana University.

It lends more credibility to U of L as a premier research university and gives the school an opportunity to compete for federal research dollars and grant programs that require this level of capacity, he added. Plus, the school now has an opportunity to help shape future technologies as opposed to simply react to them.

Wheels now in motion

With the decision in hand, U of L wasted no time moving forward.

The university connected to NewNet last month, Sawyer said, and the goal is to connect UK within the next 30 to 60 days and other schools -- both colleges and K-12 systems -- within the next 60 to 90 days.

Businesses will be allowed to connect after the schools come online.

All of the parties involved should have access to NewNet soon. However, many of these users, especially in rural parts of the state, initially will connect via existing routed networks as opposed to fiber-optic networks.

That setup will be a temporary solution until the fiber-optic network can be built throughout the state, Sawyer said, adding that the project could take up to two years to complete.

The fiber-optic build-out will undergo a bid process, possibly in late summer. Sawyer declined to disclose an estimated project cost, but he said he and others in the consortium are in the process of securing necessary funding through school contributions.

The project most likely will be a multimillion undertaking, judging by what other states have spent on similar infrastructure.

For example, I-Light, Indiana's fiber-optic network for higher education, cost more than \$5 million for the initial build out. And that dollar figure was just to cover the connection between three universities. New organization will manage the statewide network

Another piece of the puzzle is creating an organization to oversee the development of the Kentucky RON and to then manage its operations.

The organization, which has not yet been named, will pay Internet2 an annual fee of \$550,000 for two, 10-gigabit pipes that connect to NewNet.

Schools and businesses would be charged a fee to connect to NewNet via the Kentucky RON, and those fees will be used to cover the payout to Internet2.

An executive committee, with representation from U of L, UK and the Council for Postsecondary Education, is in the processing of forming the Kentucky RON organization, which should be in place by late July.

A technical committee also has formed to design the network.

"What we're trying to do is put the commonwealth of Kentucky on the national network map," Sawyer said. "We have never been there, and a lot of people thought we never would be there. But we are there now."

Indiana can vouch for advantages of an building optical network

In the late 1990s, limited network capacity became a real problem for Hoosier researchers.

Attempts to collaborate among campuses at Indiana University Bloomington, Purdue University in West Lafayette and Indiana University Purdue University

Indianapolis were difficult because of network limitations.

So university officials opted to build their own fiber-optic network with the help of \$5.3 million in state funds. The network, known as I-Light, officially launched in 2001.

(It is similar to the Kentucky regional optical network that is being developed, although I-Light is only open to higher education institutions -- not K-12 school systems and businesses like the Kentucky network will be.)

It did not take long for school officials to reap benefits from the advanced infrastructure.

Dave Jent, associate vice president of networks for IU, which manages I-Light, said other schools began to take an interest in what IU and Purdue were doing with their shared network.

Soon, IU began managing similar networks for other organizations. The school also rolled out a related project, called Indiana GigaPOP, that serves as a connection point for many research and education groups nationwide that need to connect to a national network.

For instance, GigaPOP is the portal that connects I-Light to Internet2's national network.

And as IU has developed a reputation as a technology leader, Jent said, the school has been able to attract top talent -- workers who came to Indiana to be a part of these national networking projects.

"We've been able to build a really smart, intelligent work force," he said. A significant boost in research dollars

I-Light also opened the doors for several research grants and federal dollars that the universities would not have been able to secure otherwise.

For example, IU received a National Science Foundation grant that allowed the school to build fiber-optic cabling from Indianapolis to Chicago as part of a NSF project known as the Extensible Terascale Facility, a grid-computing communication information system for researchers and educators.

IU also received grant dollars to purchase "Big Red," one of the fastest supercomputer systems in the world.

Big Red enables research at IU, and it also will be used to support the NSF's effort to create an advanced national cyberstructure.

In addition, Jent said, I-Light has been a boon for individual researchers. He recalled one biomedical researcher who was champing at the bit to collaborate with other schools.

Once networking limitations were removed because of I-Light, the researcher was able to connect with colleagues across the country. Then, people started seeking him out in an effort to partner on projects.

"It's amazing the number of people you have all of a sudden writing grants and proposals," he said. And having researchers involved on a national level helps to raise their profile as well as that of the school.

"It sort of builds on itself when you take those (networking) restrictions away," he added.

Expansion to other schools in progress

Now IU officials are building on I-Light. A second-generation network was rolled out last year in preparation for the network's expansion to all higher-education institutions throughout the state.

Nine schools have connected so far, and another four are scheduled to connect this summer, Jent said. With this expansion, I-Light has leased existing fiber-optic cabling and installed 17 switching nodes, or connection points.

But I-Light does not take the network "the last mile," Jent said. Schools must find their own way to connect to I-Light, which is encouraging telecommunications vendors to branch into rural parts of the state.

Because of I-Light, Indiana universities and colleges will spend an estimated \$15 million in the next three years to install fiber-optic cabling and related network infrastructure that will allow them to connect to the statewide optical network.

Internet2

Description: A nonprofit organization that develops and deploys advanced networking technologies Headquarters: Ann Arbor, Mich. History: In October 1996, 34 universities came together to create a national network they could use to exchange large amounts of information and to collaborate on research projects. The result was the next-generation Internet called the Abilene network, which has been running on Denver-based Qwest Communications' infrastructure for the past decade. Now, in an effort to create capacity for future needs, Internet2 is in the process of replacing Abilene with what is known as the Internet2 Network, known informally as "NewNet." The advanced network, which runs on Broomfield, Colo.-based Level 3

Communications' infrastructure, is at least 10 times faster than its predecessor, easily scaleable and less restrictive in terms of who can access the network. Membership: 209 universities; 70 corporations; 40 affiliate members, such as government agencies; and 30 research and education networks Web site: www.internet2.edu

What does Internet2 Network mean for businesses?

In the past, the Internet2 organization had some very restrictive guidelines in terms of who could access the network. And because the focus was on meeting the needs of research and education communities, businesses were left out of the loop.

But that is changing with the Internet2 Network, known informally as "NewNet." Kentucky companies interested in connecting to NewNet now will have that option via the Kentucky regional optical network, or Kentucky RON.

The organization that manages the Kentucky RON will charge businesses an access fee. Details of the fee structure have not been determined.

What does Internet2 Network mean for researchers?

Richard Clover, dean of the University of Louisville's School of Public Health and Information Sciences, said a lot of research these days is conducted by analyzing extremely large data sets, which require a significant amount of bandwidth.

And as the size of these data sets increases, the amount of bandwidth also must increase. So for any researcher who looks at data sets, Clover said, the capacity "NewNet" brings is critical.

Add in the fact that NewNet gives local researchers an avenue to connect with other research activities on a national, and even global scale, and it becomes clear why so much emphasis is being placed on access to this network.

Clover, who is a researcher, expects to benefit personally from the advanced technology. He analyzes large health data systems to determine local and national trends in health care, such as cancer rates, infectious disease outbreaks and the environment's effect on health. With NewNet, Clover will have the ability to work more closely with other researchers across the country.

Collaboration was possible via NewNet's predecessor, the Abilene network, he said, but the connection was too slow. He compared it to the difference between connecting to the Internet via phone modem versus connecting via cable or satellite -- only on a much larger scale. So NewNet is a "huge asset," he said.

What does Internet2 Network mean for Economic Development?

Along with eventually being able to connect to NewNet, a future benefit for businesses will be access to a more educated work force -- people who know how to apply technology and are comfortable in the tech environment.

That will play a significant role in the state's economic development efforts moving forward, as the quality of the work force often is one of the primary drivers in a company's decision to locate or expand in the Bluegrass State, said Joe Mefford, director of the state broadband initiative ConnectKy.

The focus of the Bowling Green, Ky.-based nonprofit group is to ensure that all households statewide have broadband access. The organization has aligned its goals with those of the state's K-12 system, which has been deploying its own network to connect its school systems.

The Kentucky regional optical network brings in higher education and helps tie all the pieces together, Mefford said, adding that the "predominant advantage is going to be educating the work force for 21st century jobs."